

Stress, length, and moraic trochees in Northern Tiwa Picurís

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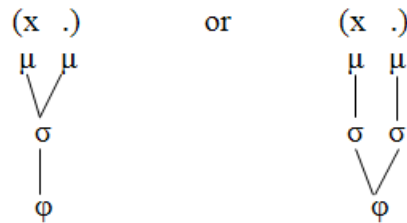
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0. Introduction

Spoken in central New Mexico, Picurís is an endangered language of the Northern Tiwa sub-group, a branch of Kiowa-Tanoan. Not much is understood about Picurís phonology beyond its phonemic segments; in particular, there are several conflicting descriptions of the prominence system of the language. In the earliest work on Picurís, John P. Harrington claims that Picurís has no stress, noting that Picurís “syllables are pronounced with force so nearly equal that stress accent has not been indicated” (Harrington 1910). Instead, Harrington chooses to record only length in his phonetically transcribed collection of Picurís texts and children’s stories (Harrington and Roberts 1928). In later work, George L. Trager—and all subsequent researchers—describe Picurís as a stress- and tone-based language, where stress and tone influence syllable length (Trager, G. 1942; Trager, F. 1971; a.o.). None of this later work, however, records length data, and, more critically, no consistent description of the lengthening effects of stress and tone is given. Typologically as well, a phonological system with distinctive length, tone, and stress is highly improbable. This paper provides a unified account of length and prominence in Picurís nouns, arguing that Picurís is a quantity-sensitive language where the basic unit of the moraic trochee governs both stress and syllable weight.

A moraic trochee is defined as a foot made up of either a heavy syllable or two light syllables, with stress on its first mora (Hayes 1995: 96):

(1) Moraic trochee



Languages with moraic trochees differ from those with syllabic trochees in that they are quantity-sensitive and tend to place strict restrictions on syllable weight. Since prominence is defined at the level of the mora, stress and length are closely related phenomena in these quantity-sensitive languages.

In this paper, a study of Picurís nouns in both Harrington's earlier and the Tragers' later data demonstrates that Picurís is a quantity-sensitive language. Because incorporation in Picurís may cause irregularities and inconsistencies in stress patterns, the analysis presented here deals primarily with free-standing nouns, where the noun root is accompanied by only the noun suffix marker, -Vne. For Picurís nouns, the stress system is hypothesized as follows:

(2) Picurís stress

- a. Basic foot structure = moraic trochee, realized as either a heavy syllable or two light syllables.



- b. R → L footing
 c. Vowels contribute one mora each.
 d. Syllable codas (a restricted set) contribute one mora.
 e. Diphthongs, which must have a rising sonority profile, contribute only one mora.
 f. Adjacent vowels, which do not have a rising sonority profile, act as singletons and contribute one mora per vowel.

In the data considered, Picurís exhibits the phonological shape and sonority hierarchy characteristics and behaviors typical to quantity-sensitive, moraic trochee languages (§1).

Further evidence for the analysis in (2) comes from mora-count constraints (§2) and the

interaction between stress, in Trager and Trager, and length, in Harrington and Roberts (§3). Once-divergent observations of stress and length can clearly be reconciled in a single system for Picurís suprasegmental phonology.

0.1 The Data

Picurís is an endangered language whose current status is questionable. The language has been heavily influenced and changed through contact with Spanish and English over the last century. Thus, the data from Harrington and Roberts' (1928) work, as well as work by George Trager and Felicia Trager, provides us with examples of Picurís prior to or at the earliest stages of the past century's language contact and attrition, making their data a valuable resource for study on Picurís. The research and analysis presented in this paper takes its data primarily from Harrington and Roberts (1928) and from a compilation of the data given in Tragers' papers. The results discussed here have yet to be verified with a native speaker of current-day Picurís, and it remains open to further exploration whether Picurís prominence has changed since the data used here was collected and assembled.

1. Picurís and bimoraic feet

Moraic trochee languages have phonological characteristics that oftentimes distinguish them from non-quantity-sensitive languages, including constraints on minimal word formation and strict observance and interaction with the sonority hierarchy. These quantity-sensitive features occur in Picurís, providing stress-independent evidence of bimoraic footing in the language.

1.1 Picurís minimum word constraint

The first clue to the basic unit of the bimoraic foot in Picurís is the minimal word length constraint: no free-standing content word may be shorter than two mora. Free-standing function words may be mono-moraic. For example, *pa* in (3) marks the agent but does not provide any further content.

- (3) 'aʎiulane pa mɛkiaheŋ
 A::3g-wife-N AGT feed-PSV-SEQ
 'his wife had given him his supper'

As opposed to function words, content words must be composed of at least two moras when unincorporated. Noun roots, therefore, never occur without a noun marker suffix, such as *-ene* in (4).

- (4) li:ueŋ
 woman-N
 'woman'

In (4), the noun root for 'woman,' *liu*, must be combined with the noun marker suffix, *-ene*, in order to occur on its own. Otherwise, noun roots must be incorporated either with postpositions or verbs, as in (5).

- (5) liu'ɔmeŋ
 woman-say to
 'said to the woman'

The minimal word constraint that Picurís has is typical of languages sensitive to the bimoraic foot, as noticed by McCarthy and Prince (1986) and affirmed typologically in Hayes (1995). That Picurís imposes strict limits on the minimum size of content words strongly suggests that the bimoraic foot is a salient and basic unit in the language.

1.2 Syllable structure and sonority hierarchy constraints in Picurís

In addition to the constraint on minimum word length, Picurís also has strict conditions on the structure of its syllables and their sonority profiles. The maximum syllable size found in Picurís is a bimoraic foot; syllables with more than two moras are not allowed. Specifically, syllables in Picurís may have two vowels in the nucleus and no coda, as in (6).

- (6) hiu

Or, they may have a single vowel with a sonorant consonant coda (7),

(7) tɛn

meaning [l], [m], or [n]. Non-sonorant consonant codas are not allowed except when they are triggered by assimilation to a following onset consonant.

(8) pup.pe

In (8), [p] is licensed as a syllable coda only because it inherits its features through germination from the following onset [p]. The hypothetical form **pup.te*, where the non-sonorant coda is not completely identical with the adjacent onset, is not found in the available Picurís data.

Diphthongs in Picurís behave similarly and are also restricted by sonority. Picurís diphthongs are a restricted set where the first vowel sound must be lower in sonority than the second. Sonority amongst vowels is defined in (9).

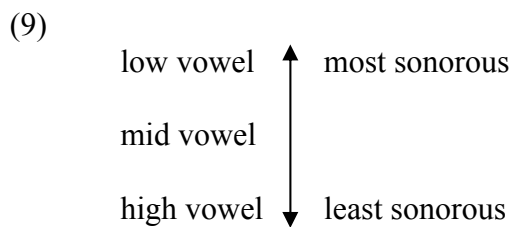


Figure (9) shows that the amount of sonority a vowel has is inversely proportional to its height: high vowels are the least sonorous, and low vowels are the most sonorous. Thus, while the sequence [ia] is a diphthong in Picurís, the reverse sequence [ai] is not.

Crucially, diphthongs are mono-moraic where vowel-vowel sequences contribute two moras—one for each vowel. This distinction is evidenced by the fact that the vowel-vowel sequence [ai] never occurs in a closed syllable while the diphthong [ia] often does:

(10) a. hiau
b. lian

In (10a), the diphthong [ia] is mono-moraic, allowing [u] to fill out the maximum bimoraic foot allowed in a syllable. Example (10b) shows the diphthong [ia] acting as a mono-moraic nucleus and the coda [n] contributing the second mora to the syllable. Crucially, a sequence of two adjacent vowels, [ai], would always contribute two mora, one for each vowel, because it does not

follow the sonority hierarchy restriction for diphthongs. The same is true for vowels of the same height—for example, [iu], which is bimoraic.

Additional evidence for the sonority distinction of Picurís diphthongs comes from Trager’s (1946) analysis of Taos, a close sister language to Picurís. Trager notes that the phonemic diphthongs in Taos are [ie], [ia], [uo], [əo], and [iɛ]. All of these Taos diphthongs follow the same Picurís restriction on sonority in diphthongs—sonority must increase from the first vowel sound in the diphthong to the second. This Northern Tiwa constraint on sonority contours in diphthongs corresponds to the expected sonority profile of trochaic feet, as presented in Prince (1983). Prince argues that, in a heavy syllable, the first mora should be more sonorous than the second because it is the head of a bimoraic foot, which is exactly the case in Picurís. This sonority-based analysis also follows naturally from an acute sensitivity to sonority contours in syllables. Because the nucleus is the sonority peak and contributes the first mora, any following decrease in sonority—even in a vowel-vowel sequence such as [ai]—signals the presence of a coda-like second mora. Vowel-vowel sequences with decreasing sonority are therefore not considered diphthongs in Picurís and are not mono-moraic.

2. Moraic trochees and Harrington’s length

Given the hypothesis that Picurís stress is determined by bimoraic footing, we would expect that words in Picurís strongly prefer an even-number of moras, with two moras per foot. Indeed, the significant majority of free-standing, noun-marker Picurís nouns in Harrington and Roberts (1928) do ($\chi^2=6.68$, $df=1$, $p<0.01$). Out of the 118 nouns available, ninety-one are even-parity—that is, they have an even number of moras, thus satisfying the bimoraic foot expectation. Some interesting cases are discussed in §2.1 and §2.2, and the exceptional, odd-parity cases are considered in §2.3.

2.1 Variable nouns and mora count

In some cases, the length marked in Harrington and Roberts (1928) changes for a given noun root. Take, for example, the word for ‘beads’ in (11), which occurs in two variants:

- (11) a. k'ə:nene
b. k'ənɛɛne

In the first form, (11a), the first vowel of the word is lengthened, and the overall mora count of is even (i.e., four). In the second form, there is an extra vowel following the first syllable, and the first vowel is short; therefore, this form also preserves the even-parity moraic structure. Another alternating example is shown (12) for the word ‘teacher.’

- (12) a. tə:pQnapɛ:wɛɛ
b. tə:pQnapɛwɛ:nɛ

The lengthening of the vowel differs in (12a) and (12b). In (12a), the antepenultimate vowel /ɛ/ is lengthened, where as in (12b), the penultimate vowel is lengthened instead. Despite this variation in the location of vowel lengthening, the word maintains an even number of moras, which satisfies its bimoraic feet.

2.2 Consonants, or high vowels?

Certain Picuris nouns in Harrington and Roberts (1928) appear to defy the even mora count expectation:

- | | | | |
|------|----|----------|--------------------------|
| (13) | a. | t'a:ienɛ | ‘creature/Earth dweller’ |
| | b. | či:uenɛ | ‘eagle’ |
| | c. | kə:ɛenɛ | ‘owl’ |

Counting the moras in the examples in (13), where each vowel contributes one mora, the words all consist of five moras rather than four or six, as is expected. Evidence from later work on Picuris and work in Taos, however, provides another explanation: the high vowels in these words are not vowels but rather consonantal onsets to the following syllables¹:

- | | | | |
|------|----|----------|--------------------------|
| (14) | a. | t'a:yenɛ | ‘creature/Earth dweller’ |
| | b. | či:wenɛ | ‘eagle’ |

¹ /y/ = IPA /j/, a palatal consonant.

c. kə:wene ‘owl’

In Taos, the word for ‘creature/Earth dweller’ is *t’byna*, with a consonant /y/ rather than a vowel. Likewise, the Taos word for ‘owl’ is *kəw’ena*, where /u/ is transcribed as /w/ instead. In the later work on Picurís, ‘woman,’ which is *li:uene* according to Harrington, is recorded as *liw’ena* (Trager, G. 1943). High vowels in Northern Tiwa, therefore, can be treated as mora-bearing vowels or syllabified as onset consonants. With this reanalysis of high vowels in (14), the words pose no problem to the bimoraic foot hypothesis: all examples in (14) have an even number of moras.

The root for ‘paint’ (15a) is particularly of interest because it demonstrates the variability of high vowels to satisfy mora-count constraints. Consider below ‘paint’ and its incorporated forms, shown with bimoraic footing:

- | | | | | |
|------|----|--------------|---------------|----------------------|
| (15) | a. | thQ:ıene | ‘paint’ | = (thQ:)(ıene) |
| | b. | thQıčal’ene | ‘blue paint’ | = (thQı)(čal)(’ene) |
| | c. | thQıphon’ene | ‘black paint’ | = (thQı)(phon)(’ene) |

In (15a), we see that the root of ‘paint’ lengthens to accommodate the bimoraic foot structure. If we assume that the /i/ in (15a) is an onset to the following syllable, then ‘paint’ has an even number of moras. In the incorporated forms (15b) and (15c), /i/ cannot be the onset to the following syllable because it is blocked by other consonants in that position; therefore, lengthening in the first syllable is not necessary since /i/ contributes a mora to the first foot of the word. Moreover, /oi/ in (15b) and (15c) cannot be mono-moraic, as discussed in §1.2, since /i/ is not more sonorous than /o/. It is evident from this example that Picurís places strict constraints on the number of moras in a given word in order to fulfill its bimoraic feet.

2.3 Exceptions: odd-parity words

Out of the 118 nouns from Harrington and Roberts (1928), only twenty-seven (~23%) do not follow the even-parity mora expectation. Many of these words exhibit variation in length of vowels or in segments, both in unincorporated and incorporated forms. The word for ‘jackrabbit,’ as shown below,

- (16) a. k'a'eneɣ 'jackrabbits'
 b. k'a'neɣ 'jackrabbit'

varies in form depending on pluralization. In its plural form, (16a), 'jackrabbits' has three moras, which violates the Picurís constraint on even-parity words. On the other hand, the singular form, (16b), obeys the constraint perfectly with two moras in the word. Variation between singular and plural forms, however, is not consistent across the data. The words in (17) and (18) seem to freely vary with and without length.

- (17) a. pɛːneɣ 'deer'
 b. 'ipɛːel'aiheɣ '3pl:B-deer-carryonback-SUB'
- (18) a. t'aːlə'au 'ears'
 b. t'aːləxwiltələmmiahɛɣ 'ear-sticks-give-inv-SEQ'
 c. 'ant'aːləxwiltowəːčehɛɣ 'agr-ear-sticks-take-out-SEQ'

In (17) and (18), the roots for 'deer' and 'ear,' respectively, exhibit variable length. The lengthening of the root vowel does not appear to be conditioned in any way by incorporation; nor is it conditioned by plurality or any other inflection.

Other odd-parity words can be potentially explained by examining the root in its incorporated form. Example (19) gives the word for 'pipe' in its free-standing form and an incorporated form.

- (19) a. xwelenɛ 'pipe'
 b. xweləmmia 'pipe-give'

From its incorporated form, we know that the root of 'pipe' is *xwel*, rather than **xwe*. Because the root-final consonant /l/ is a sonorant and can bear weight, it is possible to suppose that the noun *xwelenɛ* actually has four moras:

- (20) xwe l e neɣ
 | | | |
 (μ μ) (μ μ)

The root final sonorant consonant /l/ becomes a bearer of weight in these words and helps to satisfy the even mora count. Other words with root-final syllable consonants also behave in this way, including ‘rain’ in (21).

- (21) a. łolenę ‘rain’
 b. łolpa ‘with rain’

Example (21b) shows that the root of ‘rain’ is *lol*. Like ‘pipe,’ the root-final /l/ can be perceived to bear weight. Under this analysis, *łolenę* acceptably has four moras.

While it is possible to individually discuss the twenty-seven odd-parity cases found in Harrington and Roberts (1928), the data is unfortunately too sparse and our knowledge of Picurís prominence too uninformed to make any global generalizations across all of the exceptions.

3. Picurís moraic trochees, stress, and length effects

While there is insufficient stress-marked Picurís data available² to delve deeply into the complexities of the Picurís stress system, an analysis of the limited data available provides support for the moraic trochee hypothesis presented here.

The large majority of the stress-marked data shows that main stress of a word usually falls on the penultimate syllable, a pattern that is especially evident in the noun roots marked with the noun suffix marker:

- (22) ,mako"one ‘grandchild’

Following primary stress on the penultimate syllable, secondary stress is assigned on the preceding feet from right to left, as in the initial secondary stress of ,mako"one. Thus, the attested stress patterns we find for two-, three-, and four-syllable words in the Trager data are as listed in (23),

² Since the vast majority of Picurís data comes from Harrington and Roberts (1928) and is unmarked for stress, we must rely on the limited, stress-marked data available in George Trager and Felicia Trager’s writings on the language.

- (23) a. (σ' σ)
 b. (σ')(σ' σ)
 c. (σ' σ)(σ' σ)

where primary stress falls on the final trochaic syllabic foot and secondary stress on the feet before.

In relating the moraic trochee analysis developed in previous sections and the syllabic foot typology shown in (23), we would predict that the bi-syllabic feet in (23) consist of two light syllables while the mono-syllabic foot in (23b) consists of one heavy syllable. Hence, (23b) would have two moraic feet, with one heavy syllable followed by two light syllables:

- (24) $\begin{array}{c} (\sigma') (\sigma' \sigma) \\ \wedge \quad | \quad | \\ (\mu' \mu) (\mu' \mu) \end{array}$

We would not expect to find tri-syllabic words of the form in (25).

- (25) $\begin{array}{c} (\sigma') (\sigma' \sigma) \\ | \quad | \quad | \\ (\mu) (\mu' \mu) \end{array}$

Under the moraic trochee hypothesis, Picurís should strongly avoid the mono-moraic foot type found in (25), since moraic trochee feet must have two moras.

A lengthening rule posited by Trager, F. (1971) suggests the opposite: where mono-moraic feet would occur and create stress clash, Picurís repairs these degenerate feet with vowel lengthening. Trager's Lengthening Rule states: "a reduplicated vowel... occurs under Low tone with medial stress before a primary stress." That is, when there are two adjacent stressed syllables, the first one must be a bimoraic foot so that stress clash does not occur. The structure in (25) is therefore dispreferred, and the structure with perfect bimoraic foot in (24) is desired.

While Trager, F. (1971) provides no transcriptions of length to illustrate the Lengthening Rule, the cross-referencing of her data with Harrington and Roberts' (1928) data (Table 1) shows that tri-syllabic words with adjacent stress (and low tone on the initial syllable) indeed have the expected prosodic shape as described in the Lengthening Rule.

Table 1. Picurís nouns where Trager’s Lengthening Rule should apply

	Trager (1971)	Harrington & Roberts (1928)
a. ‘wizard/witch’	càxêne	ča:həne
b. ‘fish’	pə'êne	pə:əne
c. ‘sun’	tʰòlene	tʰo:lene
d. ‘creature/Earth-dweller’	t'àyéne	t'a:ienə
e. ‘rabbit’	pìwéne	pi:uenə

In all of the words that are found in both Trager, F. (1971) and Harrington and Roberts (1928), Trager’s Lengthening Rule applies where expected. The first syllable, as shown by Harrington and Roberts’ data in Table 1, is always lengthened and contributes two moras as a moraic trochee. Without the lengthening of the vowel, the first syllable of the words would cause a stress clash with the second syllable, as schematized in (25) above, and form a degenerate foot, which Picurís attempts to avoid. Trager’s Lengthening Rule acts as a repair for potentially problematic stress patterns in Picurís: moras are added to syllables to construct properly well-formed moraic trochees.

4. Brief notes on tone interaction with stress and length

Though the issue of tone interaction with stress and length is not fully explored in this paper, tone is something that should be considered in a discussion of the Picurís prominence system. Both Trager, F. (1971) and Amy Zaharlick (1981) allude to an effect on length when stress and tone are combined, but the actual effect has yet to be clearly described. Trager provides a scale of heaviest-to-lightest syllables in relation to certain stress and tone combinations, which is schematized here:

(1)

	Stress	Tone	Expected syllable weight
ô	primary	low	Heavy ↑
ó	primary	middle	
õ	primary	high	

ø	medial	low	Light
ø	medial	middle	
ø	medial	high	

Upon comparing Harrington and Roberts (1928) and Trager's (1971) data, the results are inconclusive. Some words, as in (2), exhibit a heavy syllable and a long vowel where we would expect it in the word.

(2)

	Trager	Harrington
a. 'flower'	pâm'emø	<u>pam</u> 'onɛ
b. 'man'	sónene	<u>sə</u> :nenɛ

In (2a) *pam-* is a heavy syllable in the Harrington and Roberts transcription and a primary low syllable in Trager's data, which corresponds to the expected weight of the syllable in Trager's analysis. Conversely, other words do not behave as expected—shown in (3).

(3)

	Trager	Harrington
a. 'rabbit'	piwéne	<u>pi</u> :uenɛ
b. 'child'	'ó'óne	' <u>o</u> ':onɛ

In (3a) and (3b), the tone and stress combination in the first syllables are medial middle and primary high, respectively. These particular tone and stress combinations are not expected by Trager to have heavy syllables; yet, they do.

Whether tone has any effect on lengthening and the weight of syllables is questionable altogether, since the examples given here demonstrate that lengthening occurs regardless of tone quality; yet, each word is metrically well-formed and the moras are completely parsed into bimoraic feet. Research on the topic of Picurís tone interactions with stress and length are left for future work.

5. Conclusion

The stress system of Picurís as developed here is reproduced below:

(26)(=2) Picurís stress

- a. Basic foot structure = moraic trochee, realized as either a heavy syllable or two light syllables.



- b. R → L footing
 c. Vowels contribute one mora each.
 d. Syllable codas (a restricted set) contribute one mora.
 e. Diphthongs, which must have a rising sonority profile, contribute only one mora.
 f. Adjacent vowels, which do not have a rising sonority profile, act as singletons and contribute one mora per vowel.

Stress-independent evidence from the minimal word constraint, the shape of diphthongs, and sonority hierarchy restrictions in syllable nuclei indicate that the basic rhythmic unit in Picurís is the moraic trochee. The prevalence of even-parity nouns in the length-marked Harrington and Roberts (1928) data also suggests that bimoraic footing plays a crucial role in the language. Additionally, comparing the stress-based observations made by Trager, G. and Trager, F. with the length-based data of Harrington and Roberts, we see the interaction of stress and length governed by moraic trochees. In many respects, Picurís is a language that exemplifies the characteristics expected of a quantity-sensitive language. And rightly so, since the evidence shows a strong preference in Picurís for strict moraic trochees in the language and a dispreference for degenerate feet.

While this paper finally reconciles the competing theories about Picurís stress and length between Harrington and later researchers (Trager, G.; Trager, F.; a.o.) in a generative analysis of the stress system, there is still a great deal that needs investigation with respect to Picurís suprasegmental phonology. This paper only deals with basic and unincorporated noun forms, and the stress patterns of vowels or the effects of morphological complexity on stress assignment requires further exploration. Furthermore, what assigns stress still remains unclear: stress may be lexically programmed, or stress contours could be assigned to the roots by suffixes and

morphology, as is the case in Taos (Nichols 1994). The issue of tone and tonal interactions with stress and length also have not been fully discussed here. Finally, due to the scarcity of Picurís data, comparisons with its closely-related sister language, Taos, may provide valuable evidence to the description of prominence in Picurís.

Kəxwəki.
 2sg:3sg-tail-have
 ‘The end.’³

³ In Picurís, it is customary to pass on the fox tail after telling a story to signify the end of your turn.

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